TFW

Docket No.: 075170-0011 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Customer Number: 20277
Katsuyuki IMAI, et al.	:	Confirmation Number: 8894
Application No.: 10/559,574	:	Group Art Unit: 2821
Filed: December 05, 2005	:	Examiner: Not yet assigned

For: RADIO WAVE LENS ANTENNA (as amended)

REQUEST FOR CORRECTED FILING RECEIPT

Mail Stop OFR
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is a copy of the Filing Receipt received from the U.S. Patent and Trademark Office in the above-referenced application. It is noted that the title, "ELECTROMAGNETIC LENS ARRAY ANTENNA DEVICE" as listed in the official filing receipt, does not reflect the change as amended in the preliminary amendment. The corrected title should read "RADIO WAVE LENS ANTENNA". Attached is a copy of the Official Filing Receipt as well as the Declaration, which evidences the error in the title. It is requested that a corrected filing receipt be issued.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

Reg. No. 51,321

Arthur J. Steiner
Registration No. 26,106

600 13th Street, N.W.
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Please recognize our Customer No. 20277 as our correspondence address.

Date: October 13, 2006

Docket No.:

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, mailing address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter claimed and for which a patent is sought on the invention entitled **RADIO WAVE LENS ANTENNA**

the specification of which

[ ] is attached hereto.
[x] was filed on **June 2, 2004** as United States Application Number _____, or PCT International Application Number **PCT/JP2004/007613** and was amended on (if applicable) _____, or
[ ] is a Continuation-In-Part (CIP) of Application Number _____, filed _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is known to me to be material to patentability in accordance with Title 37, Code of Federal Regulations, Section 1.56 including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35, United States Code, Section 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent or inventor's or plant breeder's right certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's, or plant breeder's rights certificate, or any PCT international application having a filing date before that of the application on which priority is claimed:

Prior Foreign Applications(s):

Number	Country	Day/Month/Year filed	Priority Claimed
2003-161128	**Japan**	**05/06/2003**	[x]
2004-156002	**Japan**	**26/05/2004**	[x]

I hereby claim the benefit under 35 United States Code, Section 119(e) of any United States provisional application(s) listed below.

Prior Provisional Application(s):
Application Number _____ Filing Date _____

I hereby claim the benefit under 35, United States Code, Section 120 of any United States application(s) or 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35, United States Code, Section 112. I acknowledge the duty to disclose information which is material to patentability as defined in 37, Code of Federal Regulations, Section 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Prior U.S. Application(s):
Serial No. _____ Filing Date _____ Status: Patented, Pending, Abandoned _____

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY:
As a named inventor, I hereby appoint the registered practitioners of McDermott Will & Emery LLP, included in the Customer Number provided below, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

CUSTOMER NUMBER 20277

Send correspondence to the address associated with Customer Number 20277

McDERMOTT WILL & EMERY LLP
600 13th Street, N.W.
Washington, D. C. 20005-3096

Direct Telephone Calls to: Telephone (202) 756-8000

Full name of sole or first inventor: **Katsuyuki Imai**

Inventor's signature: Katsuyuki Imai Date: November 23, 2005

Residence: **c/o Osaka Works of Sumitomo Electric Industries, Ltd., 1-3, Shimaya 1-chome, Konohana-ku, Osaka-shi, Osaka, Japan**

Citizenship: **Japan**

Post Office Address: **Same as above**

Full name of second inventor: **Masatoshi Kuroda**

Inventor's signature: Masatoshi Kuroda Date: November 23, 2005

Residence: **c/o Osaka Works of Sumitomo Electric Industries, Ltd., 1-3, Shimaya 1-chome, Konohana-ku, Osaka-shi, Osaka, Japan**

Citizenship: **Japan**

Post Office Address: **Same as above**

Full name of third inventor:

Inventor's signature: Date:

Residence:

Citizenship:

Post Office Address:

Full name of fourth inventor:

Inventor's signature: Date:

Residence:

Citizenship:

Post Office Address:

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPL NO.	FILING OR 371 (c) DATE	ART UNIT	FIL FEE REC'D	ATTY.DOCKET NO	DRAWINGS	TOT CLMS	IND CLMS
10/559,574	12/05/2005	2821	900	075170-0011	12	20	2

20277
MCDERMOTT WILL & EMERY LLP
600 13TH STREET, N.W.
WASHINGTON, DC 20005-3096

CONFIRMATION NO. 8894

FILING RECEIPT

OC000000018310615

Date Mailed: 03/21/2006

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

Applicant(s)

Katsuyuki Imai, Osaka, JAPAN;
Masatoshi Kuroda, Osaka, JAPAN;

Power of Attorney: The patent practitioners associated with Customer Number **20277**.

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/JP04/07613 06/02/2004

Foreign Applications

JAPAN 2003-161128 06/05/2003
JAPAN 2004-156002 05/26/2004

If Required, Foreign Filing License Granted: 03/16/2006

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US10/559,574

Projected Publication Date: 06/22/2006

Non-Publication Request: No

Early Publication Request: No

Title Electromagnetic lens array antenna device

Preliminary Class

343

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

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NOT GRANTED

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UNITED STATES PATENT AND TRADEMARK OFFICE

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U.S. APPLICATION NUMBER	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
10/559,574	Katsuyuki Imai	075170-0011

INTERNATIONAL APPLICATION NO.	
PCT/JP04/07613	
I.A. FILING DATE	PRIORITY DATE
06/02/2004	06/05/2003

20277
MCDERMOTT WILL & EMERY LLP
600 13TH STREET, N.W.
WASHINGTON, DC 20005-3096

CONFIRMATION NO. 8894

371 ACCEPTANCE LETTER

DC00000018310616

Date Mailed: 03/21/2006

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office in its capacity as a Designated / Elected Office (37 CFR 1.495), has determined that the above identified international application has met the requirements of 35 U.S.C. 371, and is ACCEPTED for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above and the relevant dates are:

12/05/2005	12/05/2005
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) REQUIREMENTS	DATE OF COMPLETION OF ALL 35 U.S.C. 371 REQUIREMENTS

A Filing Receipt (PTO-103X) will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE " FILING DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1), (c)(2) and (c)(4) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN ABOVE.** *The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363).* Once the Filing Receipt has been received, send all correspondence to the Group Art Unit designated thereon.

The following items have been received:

- Copy of the International Application filed on 12/05/2005
- English Translation of the IA filed on 12/05/2005
- Copy of the International Search Report filed on 12/05/2005
- Copy of IPE Report filed on 12/05/2005
- Copy of Annexes to the IPER filed on 12/05/2005
- English Translation of Annexes to the IPE filed on 12/05/2005
- Preliminary Amendments filed on 12/05/2005
- Information Disclosure Statements filed on 12/05/2005
- Oath or Declaration filed on 12/05/2005
- Request for Immediate Examination filed on 12/05/2005
- U.S. Basic National Fees filed on 12/05/2005

- Assignment filed on 12/05/2005
- Priority Documents filed on 12/05/2005
- Specification filed on 12/05/2005
- Claims filed on 12/05/2005
- Abstracts filed on 12/05/2005
- Drawings filed on 12/05/2005

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

KAREN R MCLEAN
Telephone: (703) 308-9140 EXT 214

PART 1 - ATTORNEY/APPLICANT COPY

FORM PCT/DO/EO/903 (371 Acceptance Notice)

IN THE SPECIFICATION:

Please amend the title of the invention as follows:

~~ELECTROMAGNETIC LENS ARRAY ANTENNA DEVICE~~ RADIO WAVE LENS ANTENNA

Please insert the following paragraph on page 1 below the title of the Invention and above the "Field of the Invention":

-- Related Application

This application is the U.S. National Phase under 35 U.S.C. § 371 of International Application No. PCT/JP2004/007613, filed on June 2, 2004, which in turn claims the benefit of Japanese Application No. 2003-161128, filed on June 5, 2003, and Japanese Application No. 2004-156002, filed on May 26, 2004, the disclosures of which Applications are incorporated by reference herein. –

Please amend the paragraph beginning at page 5, line 11 as follows:

Figs. ~~2(a), (b)~~ 2A and 2B show the comparative antenna patterns in cases of a uniform amplitude distribution and a tapered amplitude distribution. As shown Fig. [[2(a)]] 2A, if the amplitude distribution is uniform, the levels of the sidelobes S compared to that of the main lobe M become relatively high, whereas the sidelobes S are decreased if the amplitude distribution is tapered as shown in Fig. [[2(b)]] 2B.

Please amend the paragraph beginning at page 6, line 7 as follows:

Meanwhile, [[since]] a focal length of conventional parabolic antenna is greater than that of the lens antenna~~, the physical interval between primary feeds required to independently communicate with adjacent satellites can be large~~. Therefore, the primary feed can be designed without restriction on that account and a circular horn antenna (conical horn antenna whose opening size is over 30 mm) is generally used. However, the parabolic antenna cannot communicate with a plurality of satellites. Further, there is a problem that the parabolic antenna is bulky, because parts

such as a supporting arm or the like of the primary feed become bigger to accommodate the longer focal length.

Please insert the following before the "Detailed Description of the Preferred Embodiment" on page 11, at line 11:

--Brief Description of the Drawings

Fig. 1 offers a schematic diagram of an antenna using a hemispherical Luneberg radio wave lens.

Fig. 2A shows an antenna pattern in case of a uniform amplitude distribution and Fig. 2B is an antenna pattern in case of a tapered amplitude distribution.

Fig. 3A provides a perspective view for describing main parts of an exemplary primary feed and Fig. 3B illustrates a cross section of a rectangular waveguide.

Fig. 4 sets forth a perspective view for describing main parts of another exemplary primary feed.

Fig. 5 shows a side view for describing main parts of the basic configuration of the primary feed.

Fig. 6 provides a side view of the main parts of the primary feed further having a choke structure.

Fig. 7 describes a cross sectional view of the main parts of the primary feed loaded with a convex lens-shaped dielectric body.

Fig. 8A depicts the disposition of two primary feeds employing circular waveguides and Fig. 8B is the disposition of two primary feeds employing rectangular waveguides.

Figs. 9A to 9F describe specific examples for the cross sectional shape of the protrusion of the dielectric body.

Figs. 10A to 10D provide specific examples for the side shape of the protrusion of the dielectric body.

Fig. 11 shows an example of suppressing the coupling by using primary feeds loaded with dielectric bodies of a shape having a non-rotational symmetric end.

Figs. 12A and 12B show an example for suppressing the coupling by cutting out a part of the dielectric body protruded from the waveguide.

Fig. 13 presents antenna patterns for comparing weak coupling with strong coupling.

Fig. 14 shows an antenna pattern of an antenna with wide full width at half maximum.

Fig. 15 describes an antenna pattern of an antenna in case of using a dielectric-loaded waveguide antenna as a primary feed.--

Please amend the paragraph beginning at page 11, line 14 as follows:

Figs. 3A to 13 represent preferred embodiments of the present invention. The basic structure of a radio wave lens antenna in accordance with the present invention is identical to that shown in Fig. 1 (there can be the one that employs a spherical Luneberg radio wave lens without a reflective plate) except a primary feed and a method for disposing two primary feeds closely. Thus, only the structures or the disposition methods of the primary feeds are described in the embodiments.

Please amend the paragraph beginning at page 11, line 22 as follows:

A primary feed 3 in Fig. 3A is constructed by loading a dielectric body 6 having a polygonal column shape at the end opening of a rectangular waveguide 4.

Please amend the paragraph beginning at page 12, line 9 as follows:

The material of the waveguides 4 and 5 can be a metal such as brass or aluminum or a die-casting with a high production yield. For the size of the waveguides 4 and 5, each side can be not greater than 18 mm (both a and b in Fig. [[3(a)]] 3A are not greater than 18 mm) in case of a rectangular waveguide for 12 GHz frequency band, for example. Therefore, even though the interval between primary feeds is 19.2 mm as described above, the primary feeds can be arranged at desired positions without interfering each other.

Please amend the paragraph beginning at page 13, line 11 as follows:

Figs. 8A to 13 provide useful primary feeds when intervals between elements are small and there is a potential coupling problem.

Please amend the paragraph beginning at page 13, line 14 as follows:

In Figs. ~~8(a), (b)~~ 8A and 8B, there are respectively shown two primary feeds 3 using circular waveguides 5 and using rectangular waveguides 4 which are arranged at the interval of P corresponding to the distance between geostationary satellites. The rectangular waveguide is advantageous in that it has a smaller tube size than the circular waveguide when adapted to a radio wave of a same frequency. Therefore, in case two primary feeds 3 are arranged at the interval of P by using the rectangular waveguides 4, the interval P1 between dielectric bodies 6 of both primary feeds is larger than the case by using the circular waveguides 5 and, thus, the coupling becomes weaker.

Please amend the paragraph beginning at page 13, line 26 and bridging page 14 as follows:

Each primary feed is arranged toward the center of the radio wave lens and thus the interval between the adjacent primary feeds becomes narrower when approaching closer to the ends of the elements. Therefore, it is preferable that the dielectric body 6 protruded from the waveguide is of a taper shape having a thinned end. [[Fig. 9]] Figs. 9A to 9F illustrate[[s]] exemplary cross sectional views of the protrusions. In all the exemplified protrusions, the width w (minor axis of an ellipse) is smaller than the dimension d in the direction normal to the width (major axis of an ellipse). Thus, by setting the direction of the dielectric body 6 in such a manner that the width direction coincides with the arranged direction of the primary feeds, a distance between the dielectric bodies of the adjacent primary feeds can be made larger.

Please amend the paragraph beginning at page 14, line 15 as follows:

[[Fig. 10]] Figs. 10A to 10D show[[s]] examples in which each of the protrusions of the dielectric bodies 6 from the waveguides has a taper shape having a thinned end. In Fig. [[10(a)]] 10A, the dielectric body 6 protruded from the waveguide is of an elliptical or polygonal cone shape while the apex of the cone is located at the center axis of the base of the cone. By cutting out the end of the protrusion as shown in Fig. ~~10(b) or 10(c)~~ 10B or 10C, the dimension of the primary feed along the axial direction is reduced. Thus, since the distance from the surface of the radio wave lens to the focal point becomes small, the size of the antenna can be further scaled down.

Please amend the paragraph beginning at page 15, line 1 as follows:

Further, considering water repellence in case of being wetted by rain, it is preferable that the cut-out end of the dielectric body 6 is of a round shape as shown in Fig. [[10(c)]] 10C rather than flat as shown in Fig. [[10(b)]] 10B.

Please amend the paragraph beginning at page 15, line 5 as follows:

When the protrusion of the dielectric body 6 is of a cone-shape, the vertex is located off the center axis of the base of the cone as illustrated Fig. [[10(d)]] 10D. In the present invention, two primary feeds 3 each having the dielectric body 6 whose protrusion is of a non-rotational symmetrical shape as described above are disposed closely. If two primary feeds are disposed closely, mutual coupling phenomena occurs, resulting in the distortion of radio waves captured by the respective primary feeds. However, the distortion can be reduced by disposing the ends of the protrusions of the dielectric bodies 6 at off-centered positions in such manner that they are remotely spaced apart from each other as shown in Fig. 11.

Please amend the paragraph beginning at page 15, line 19and bridging page 20 as follows:

As illustrated in [[Fig. 12]] Figs. 12A and 12B, a part of the outer periphery of the protrusion of the dielectric body 6 is cut out along the plane of a direction intersecting the cross section normal to the axis of the waveguide and such dielectric bodies 6 are loaded to the waveguides of the adjacent primary feeds in such a manner that the cut out surfaces of the outer peripheries face each other. The coupling can be also reduced in such a structure. Although the cut out surface of the outer periphery of the dielectric body 6 is shown to be perpendicular to the

cross section normal to the axis, it need not be.

Please amend the paragraph beginning at page 16, line 18 and bridging page 17 as follows:

All of the above described primary feeds satisfy the following basic properties 1)-4) which are required in the element for the radio wave lens antenna of Fig. 1. Consequently, the requirement of the low sidelobe can be satisfied, which makes independent communications with adjacent satellites possible and which is a collective characteristic with a Luneberg radio wave lens:

1) The size is equal to or less than 0.8λ (λ: wavelength, for example, about 25 mm in case of 12.5 GHz frequency);

2) For example, the full width at half maximum of about 50 degrees can be realized;

3) It is a linearly polarized wave antenna for common use for both vertical (V) and horizontal (H) linearly polarized waves (if this condition is satisfied, it can be applied to the circularly polarized wave antenna); and

4) The antenna patterns of the E-plane and H-plane (see Fig. [[3(b)]] 3B) can be identical as much as possible.

Please delete the paragraphs beginning on page 18, at line 1 and ending on page 20, at line 4 as follows:

~~Brief Description of the Drawings~~

~~Fig. 1 offers a schematic diagram of an antenna using a hemispherical Luneberg radio wave lens.~~

~~Fig. 2(a) shows an antenna pattern in case of a uniform amplitude distribution and Fig. 2(b) is an antenna pattern in case of a tapered amplitude distribution.~~

~~Fig. 3(a) provides a perspective view for describing main parts of an exemplary primary feed and Fig. 3(b) illustrates a cross section of a rectangular waveguide.~~

~~Fig. 4 sets forth a perspective view for describing main parts of another exemplary primary feed.~~

~~Fig. 5 shows a side view for describing main parts of the basic configuration of the primary feed.~~

Fig. 6 provides a side view of the main parts of the primary feed further having a choke structure.

Fig. 7 describes a cross sectional view of the main parts of the primary feed loaded with a convex lens-shaped dielectric body.

Fig. 8(a) depicts the disposition of two primary feeds employing circular waveguides and Fig. 8(b) is the disposition of two primary feeds employing rectangular waveguides.

Figs. 9(a) to 9(f) describe specific examples for the cross sectional shape of the protrusion of the dielectric body.

Figs. 10(a) to 10(d) provide specific examples for the side shape of the protrusion of the dielectric body.

Fig. 11 shows an example of suppressing the coupling by using primary feeds loaded with dielectric bodies of a shape having a non-rotational symmetric end.

Fig. 12 shows an example for suppressing the coupling by cutting out a part of the dielectric body protruded from the waveguide.

Fig. 13 presents antenna patterns for comparing weak coupling with strong coupling.

Fig. 14 shows an antenna pattern of an antenna with wide full width at half maximum.

Fig. 15 describes an antenna pattern of an antenna in case of using a dielectric loaded waveguide antenna as a primary feed.

[Description of the Reference numeral]

1 ——— Luneberg radio wave lens

2 ——— Reflective plate

3 ——— Primary feed

4 ——— Rectangular waveguide

5 ——— Circular waveguide

6 ——— Dielectric body

7 ——— Groove

~~A ——— radio wave~~

~~M ——— Main lobe~~

~~S ——— Sidelobe~~

Please amend the Abstract as follows:

Abstract

A multi-beam lens antenna for individual communication with communication satellites spaced at small elongations. The multi-beam antenna comprises ~~antenna elements~~ primary feeds 3 each of which is composed of a waveguide having an opening at the end and a dielectric body 6 disposed at the end, a hemispherical Luneberg ~~electromagnetic~~ radio wave lens, and a reflective plate attached to the circular opening of the hemispherical ~~electromagnetic~~ radio wave lens and adapted for reflecting a radio wave incoming from the sky or emitted toward a target. The waveguides are preferably rectangular waveguides 4 rather than circular waveguides 5. The dielectric bodies 6 are preferably tapered.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1 – 10. *(Cancelled)*

11. (New) A radio wave lens antenna comprising:

a hemispherical radio wave lens for focusing radio wave beams;

a reflective plate attached to a half-cut surface of the sphere of the radio wave lens for reflecting radio waves incoming from the sky or radiated toward targets; and

primary feeds positioned at arbitrary radio wave focus points of the radio wave lens for transmitting or receiving the radio waves,

wherein each primary feed includes a dielectric-loaded waveguide antenna where a dielectric body is loaded at an end opening of a waveguide and two of the primary feeds are installed closely and centers of the ends of the dielectric bodies of the two closely disposed primary feeds are disposed at off-centered positions in a direction that the centers are remotely spaced apart from each other to be located off the extension of each waveguide's center axis.

12. (New) A radio wave lens antenna comprising:

a spherical radio wave lens for focusing radio wave beams; and

primary feeds positioned at arbitrary radio wave focus points of the radio wave lens for transmitting or receiving the radio waves,

wherein each primary feed includes a dielectric-loaded waveguide antenna where a dielectric body is loaded at an end opening of a waveguide and two of the primary feeds are installed closely and centers of the ends of the dielectric bodies of the two closely disposed primary feeds are disposed at off-centered positions in a direction that the centers are remotely spaced apart from each other to be located off the extension of each waveguide's center axis.

13. (New) The radio wave lens antenna of claim 11, wherein the dielectric-loaded waveguide antenna is a dielectric-loaded rectangular waveguide antenna where the dielectric body is loaded at the end opening of a rectangular waveguide.

14. (New) The radio wave lens antenna of claim 12, wherein the dielectric-loaded waveguide antenna is a dielectric-loaded rectangular waveguide antenna where the dielectric body is loaded at the end opening of a rectangular waveguide.

15. (New) The radio wave lens antenna of claim 11, wherein the dielectric body of the dielectric-loaded waveguide antenna is protruded forward from the waveguide and a protruded portion of the dielectric body is of a taper shape having a thinned end.

16. (New) The radio wave lens antenna of claim 12, wherein the dielectric body of the dielectric-loaded waveguide antenna is protruded forward from the waveguide and a protruded portion of the dielectric body is of a taper shape having a thinned end.

17. (New) The radio wave lens antenna of claim 11, wherein the dielectric body is protruded forward from the waveguide and a part of an outer periphery of a protruded portion of the dielectric body is removed along a plane of a direction intersecting a cross section of the waveguide.

18. (New) The radio wave lens antenna of claim 12, wherein the dielectric body is protruded forward from the waveguide and a part of an outer periphery of a protruded portion of the dielectric body is removed along a plane of a direction intersecting a cross section of the waveguide.

19. (New) The radio wave lens antenna of claim 15, wherein in a plane including a cross section of the protruded portion of the dielectric body protruded forward from the waveguide, a dimension of the protruded portion in a disposed direction of the primary feeds is smaller than that in a direction normal to the disposed direction of the primary feeds.

20. (New) The radio wave lens antenna of claim 16, wherein in a plane including a cross section of the protruded portion of the dielectric body protruded forward from the waveguide, a dimension of the protruded portion in a disposed direction of the primary feeds is smaller than that in a direction normal to the disposed direction of the primary feeds.

21. (New) The radio wave lens antenna of claim 17, wherein in a plane including a cross section of the protruded portion of the dielectric body protruded forward from the waveguide, a dimension of the protruded portion in a disposed direction of the primary feeds is smaller than that in a direction normal to the disposed direction of the primary feeds.

22. (New) The radio wave lens antenna of claim 18, wherein in a plane including a cross section of the protruded portion of the dielectric body protruded forward from the waveguide, a dimension of the protruded portion in a disposed direction of the primary feeds is smaller than that in a direction normal to the disposed direction of the primary feeds.

23. (New) The radio wave lens antenna of claim 15, wherein an end of the dielectric body protruded from the waveguide is cut out such that the end of the dielectric body is of flat or a round shape.

24. (New) The radio wave lens antenna of claim 16, wherein an end of the dielectric body protruded from the waveguide is cut out such that the end of the dielectric body is of flat or a round shape.

25. (New) The radio wave lens antenna of claim 17, wherein an end of the dielectric body protruded from the waveguide is cut out such that the end of the dielectric body is of flat or a round shape.

26. (New) The radio wave lens antenna of claim 18, wherein an end of the dielectric body protruded from the waveguide is cut out such that the end of the dielectric body is of flat or a round shape.

27. (New) The radio wave lens antenna of claim 19, wherein an end of the dielectric body protruded from the waveguide is cut out such that the end of the dielectric body is of flat or a round shape.

28. (New) The radio wave lens antenna of claim 20, wherein an end of the dielectric body protruded from the waveguide is cut out such that the end of the dielectric body is of flat or a round shape.

29. (New) The radio wave lens antenna of claim 21, wherein an end of the dielectric body protruded from the waveguide is cut out such that the end of the dielectric body is of flat or a round shape.

30. (New) The radio wave lens antenna of claim 22, wherein an end of the dielectric body protruded from the waveguide is cut out such that the end of the dielectric body is of flat or a round shape.

IN THE DRAWINGS:

The attached sheets of drawings includes changes to Fig. 2, Fig. 3, Figs. 8-10 and Fig. 12. These sheets, which includes Figs. 2A and 2B, Figs. 3A and 3B, Figs. 8A and 8B, Figs. 9A to 9F, Figs. 10A to 10D and Figs. 12A and 12B, replace the original sheets including Fig. 2, Fig. 3, Figs. 8-10 and Fig. 12.

In Fig. 2, --(a)-- has been changed to "FIG.. 2A"
In Fig. 2, --(b)-- has been changed to "FIG.. 2B"
In Fig. 3 --(a)-- has been changed to "FIG.. 3A"
In Fig. 3, --(b)-- has been changed to "FIG.. 3B"
In Fig. 8, --(a)-- has been changed to "FIG.. 8A"
In Fig. 8, --(b)-- has been changed to "FIG.. 8B"
In Fig. 9, --(a)-- has been changed to "FIG.. 9A"
In Fig. 9, --(b)-- has been changed to "FIG.. 9B"
In Fig. 9, --(c)-- has been changed to "FIG.. 9C"
In Fig. 9, --(d)-- has been changed to "FIG.. 9D"
In Fig. 9, --(e)-- has been changed to "FIG.. 9E"
In Fig. 9, --(f)-- has been changed to "FIG.. 9F"
In Fig. 10, --(a)-- has been changed to "FIG.. 10A"
In Fig. 10, --(b)-- has been changed to "FIG.. 10B"
In Fig. 10, --(c)-- has been changed to "FIG.. 10C"
In Fig. 10, --(d)-- has been changed to "FIG.. 10D"
In Fig. 12, --(a)-- has been changed to "FIG.. 12A"
In Fig. 12, --(b)-- has been changed to "FIG.. 12B"

Attachment: Replacement Sheets
Annotated Sheets Showing Changes

REMARKS

The title of the above-referenced application has been amended to more clearly identify the present invention. The specification has been amended to reflect minor changes therein and incorporate the continuity information. The abstract has been amended in order to more clearly describe the present invention. No new matter has been introduced.

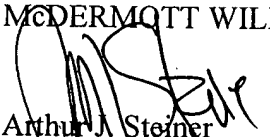
The claims have been also amended to further clearly define the subject matter of the present invention. Claims 1-10 have been cancelled and claims 11-30 have been added. No new matter has been added.

The Drawings have been amended to more clearly identify the figures. No new matter has been introduced.

Entry of this amendment is respectfully requested.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP



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